

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**



Consommation  
et Corporations Canada

Consumer and  
Corporate Affairs Canada

Bureau des brevets

Patent Office

Ottawa, Canada  
K1A 0C9

(11) (C) **1,307,568**

(21) 556,916

(22) 1988/01/20

(45) 1992/09/15

(52) 339-92

(51) INTL.CL. <sup>5</sup> H01R-13/627; H01R-13/639

(19) (CA) **CANADIAN PATENT** (12)

(54) Latching Apparatus for an Electrical Connector

(72) Noorily, Peter , U.S.A.

(73) Thomas & Betts Corporation , U.S.A.

(30) (US) U.S.A. 006,418 1987/01/23

(57) 15 Claims

**Canada**

556916

1                    LATCHING APPARATUS FOR AN ELECTRICAL CONNECTOR

5                    ABSTRACT

10                   A latching apparatus is provided for an  
                     electrical connector of the type having a housing including  
                     a plurality of electrical contacts therein. The latching  
                     apparatus comprises a deflectable arm that is pivotally  
15                   supported on the connector housing, the pivot being  
                     disposed generally between the two ends of the pivotal arm  
                     such that both opposed ends of such arm may move relatively  
                     toward and away from the connector housing. The front end  
20                   of the deflectable arm is provided with a latch for  
                     attachment to a complementary latch of a mateable  
                     electrical connector or the like. A slidable locking bar  
                     is captively supported on the housing for movement between  
                     a first position and a second position. The locking bar  
25                   and deflectable arm include cooperative locking means  
                     disposed on both sides of the pivot that are operative in  
                     the first position to prevent movement of both ends of the  
                     latching arm and in the second position to permit free  
30                   movement of both arm ends. As such, when the bar is in the  
                     first position, secured locking engagement of the latch is  
                     provided when attached to the mateable connector, while  
                     when the locking bar is in the second position, the free  
35                   movement of the deflectable arm permits ease of attachment  
                     to or detachment from the mateable connector.

LATCHING APPARATUS FOR AN ELECTRICAL CONNECTOR1 FIELD OF THE INVENTION:

The present invention relates to an improved latching apparatus for an electrical connector that is particularly useful in the data communications industry.

5 BACKGROUND OF THE INVENTION:

In the use of electrical connectors there is need to provide secured mechanical and electrical engagement between the electrical connector and a mateable electrical connector or other electrical device or equipment. Various latching techniques have been devised for use with electrical connectors in an effort to provide such secured engagement. One of the concerns in providing this secured engagement is the ease with which the connectors may be both attached to and detached from other devices. To satisfy this concern, connectors having latching mechanisms comprising pivotally supported latching arms that facilitate both ease of attachment and detachment have been developed. For example, latching structures of this type are shown in U.S. Patent 4,449,778 (issued on May 22, 1984) and U.S. Patent 4,501,459 (issued on February 26, 1985), both of these connectors being of the electrically shielded type for particular use in the data communications industry. While the pivotal latching arms, as shown in these patents, assist in the ease of attachment and detachment, there is no positive locking structure that maintains the connector in secured relation once connected to another connector or other electrical component. In an effort to compensate for this problem, a separate, external wedge is provided for subsequent attachment to the electrical connector in a manner to prevent the latching mechanism from separating in use.

30 In another known shielded electrical connector a latching structure is provided to not only facilitate the

35



ease of attachment and detachment but also to provide a locking device while the connector is in use. In U.S. Patent 4,619,494 (issued on October 28, 1986) and assigned to the same Assignee as is the subject application, the latching mechanism includes a slidable actuator that moves a pivotal latching arm in a manner to control both attachment and detachment as well as to serve as a lock to provide secure engagement while the connector is in use. While it is advantageous to maintain some of the features of the known connectors and their latching mechanisms, it is also desirable to provide improvements thereto, considering both cost and ease of use.

SUMMARY OF THE INVENTION:

It is an object of the present invention to provide an improved latching apparatus in an electrical connector.

In accordance with a preferred form of the invention, an improved latching apparatus is provided in an electrical connector of the type having a housing and a plurality of electrical contacts therein. The latching apparatus comprises an elongate member deflectably supported by a pivot on the housing, the pivot being located generally intermediate such elongate member. As a result of such pivotal support, at least one longitudinal end of the elongate member may move generally transversely toward and away from the housing. The one end of the elongate member includes a latch for latching to a latch of another mateable connecting device. The latching apparatus further includes a movable locking bar captively supported on the housing for slidable movement thereon between a first position and a second position. The locking bar and the elongate member include cooperative locking means disposed on both sides of the pivot, operative when the locking bar is in the first position to prevent transverse movement of the one end of the member and non-operative when the locking

sd/rr

A 1 bar is in the second position, thereby permitting  
transverse movement of <sup>the one end</sup> ~~both ends~~ of the elongate member.

BRIEF DESCRIPTION OF THE DRAWINGS:

5 Figure 1 is a side perspective view of a shielded electrical connector embodying the improved latching apparatus of the subject invention.

Figure 2 is a top plan view of the slidable locking bar of the subject latching apparatus.

10 Figure 3 is a side elevation view of a portion of the housing of the electrical connector of Figure 1 showing the latching apparatus with the locking bar disposed in a first position wherein the latching arm is in a locked condition.

15 Figure 4(a) is a side elevation view, as in Figure 3, now showing the locking bar in a second position wherein the latching arm is free to pivot, the latch at the mating end being shown in an upward position.

20 Figure 4(b) is a side elevation view, as in Figure 4A, wherein the locking bar is in the second position and wherein the latching arm is pivoted such that the latch at the mating end is in a downward position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT:

25 Referring now to the drawings, there is shown in Figure 1 an electrical connector 10 of the shielded type as more particularly shown and described in commonly owned Patent U.S. 4,619,494 as referred to hereinabove. Briefly, connector 10 comprises an insulative housing 12, a front end 12a of which defines a mating end of the connector and a rear end 12b of which is adapted to receive a shielded  
30 electrical cable 14 for internal connection to a plurality of electrical contacts (not shown) supported interiorly of the housing 12. Latching apparatus 15, as will be described in more detail hereinbelow, is incorporated in electrical connector 10. It should be appreciated,  
35 however, that the latching apparatus of the subject

1 invention, while particularly useful in the type of  
electrical connector as shown herein, is not so limited and  
may be used with other electrical connectors.

5 Turning now also to Figure 2, Figure 3 and  
Figures 4(a) and (b), the details of the latching apparatus  
may be more fully understood. Latching apparatus 15  
comprises a relatively rigid, deflectable latching arm 16  
that is pivotally mounted on the housing cover 18 and a  
10 slidable locking bar 20. Housing cover 18 is a portion of  
the housing and is preferably separable from the remainder  
of the electrical housing 12 in a manner to facilitate the  
termination of the electrical cable 14 to the connector  
contacts supported in the housing. The deflectable arm 16  
15 is attached to the cover 18 by a flexible web 22 such that  
the arm 16 is upwardly spaced from and pivotally movable on  
the cover 18. The deflectable arm 16 is generally  
elongate, the arm 16 being supported on the cover 18  
intermediate its front end 16a and its rear end 16b. As  
20 such, both the front end 16a and the rear end 16b of the  
flexible latching arm are movable generally transversely  
toward and away from the cover 18 of the electrical  
connector housing. The front end 16a of the arm is  
particularly configured to provide a latch thereat for  
25 mechanical engagement with a complementary latch of another  
electrical connector or other electrical device. Adjacent  
the front end 16a of the deflectable arm and disposed on  
its lower surface is a downwardly projecting member  
defining a locking spacer 24. At the opposite end 16b of  
30 the arm, a generally curved recess 26 is formed in the  
lower surface of the arm 16. The function and purpose of  
the arm locking spacer 24 and the recess 26 will be  
described hereinafter.

35 The slidable locking bar 20 is relatively rigid  
and is of generally planar construction. At the rear end  
of the locking bar there is provided an upwardly extending  
handle 28 adapted for manual grasping and operation of the

1 latching apparatus by the user. Upwardly extending from  
the upper surface of the locking bar 20 is a projection  
defining a bar locking spacer 30, locking spacer 30 being  
5 adapted and configured for engagement with the deflectable  
arm 16. The front end of the locking bar comprises a  
downwardly tapering surface 32 adapted for engagement with  
the locking spacer 24 of the deflectable arm 16.

As shown particularly in Figure 2, the locking  
bar 20 includes at its front end 20a a pair of spaced tines  
10 34 defining a slot 36 therebetween, tines 34 being  
resiliently laterally deflectable toward and away from each  
other. In the preferred form, the bar locking spacer 30 is  
of two-part construction with a space therebetween.  
Locking bar 20 further includes adjacent its front end 20a  
15 a generally curved upwardly extending protrusion 38  
disposed on either side of the slot 36.

The sliding bar 20 is captively supported for  
sliding, longitudinal movement between the deflectable arm  
16 and the housing cover 18. In the preferred  
20 configuration the flexible web 22 is of two-part  
construction with an opening (not shown) therebetween. The  
resiliently deflectable tines are inserted through the  
opening between the two-parts of the web 22, laterally  
deflecting the tines until shoulders 34a of each tine  
25 pass through the web opening. Shoulders 34a and rear  
surfaces 20b serve to captivate the sliding bar about the  
web 22. Longitudinal sliding of the locking bar 20 is  
controlled by guide blocks 35 (see Fig. 1) disposed on the  
cover 18 and which engage the side, marginal edges of the  
30 locking bar during movement.

Referring now to Figures 3 and 4(a) and 4(b), the  
operation of the latching apparatus is more fully  
described. In Figure 3, the locking bar 20 has been moved,  
by use of the handle 28, longitudinally to a first position  
35 which defines a locking position of the latching arm 16.



1 In this position, the front surface 32 of the sliding bar  
20 is in engagement with the downwardly projecting arm  
locking spacer 24 and the bar locking spacer 30 is engaged  
5 in the recess 26 of the deflectable arm 16. As the  
engagement of the respective locking spacers 24 and 30 is  
provided on both sides of the pivot 22 supporting the  
deflectable arm 16, transverse movement of both ends 16a and  
16b of the arm 16 is effectively prevented. As such, in  
10 connector use, the latch provided at the front end 16a of  
the arm is maintained in a positive locking position  
thereby preventing inadvertent disconnection during use  
which could occur due to vibrations and the like. The  
locked position is releasably held by a detent that is  
15 provided by the resilient receipt of the top of the bar  
locking spacer 30 in the arm recess 26. This detent is  
overcome by manually pulling the locking bar 20, leftwardly  
in the drawing figures.

Turning now to Figures 4(a) and 4(b), the  
facilitation of attachment to and detachment from other  
20 connectors or electrical components is shown. In Figure  
4(a) the locking bar 20 has been slid longitudinally  
rearwardly to its second position. In this position, bar  
locking spacer 30 has been pulled out from the recess 26 of  
the deflectable arm 16 and the bar front engagement surface  
25 32 has been separated from the arm locking spacer 24. As  
such, both the front end 16a and rear end 16b of the  
deflectable arm 16 are free to move transversely toward and  
away from the cover 18. In this second position, the  
protrusion 38 on the locking bar 20 is disposed at a  
30 location coincident with the pivot 22. As such, the  
protrusion 38 will contact the undersurface of the arm in a  
manner to minimize any loose movement of the locking bar 20  
that could result in this position inasmuch as the locking  
bar is held only at the rear of the connector by the guide  
35 blocks 35.

1           In Figure 4(a), for example, as a result of a  
downward force on the rear end 16b, as represented by arrow  
40, the front end 16a is pivoted upwardly away from the  
cover 18. In use, the latch at the front end 16a of the  
5   arm is thereby permitted to be attached to or detached from  
another latch, generally shown by reference numeral 42,  
from this upward position. On the other hand, as shown in  
Figure 4(b), when the locking bar 20 is in the second  
position, the front end 16a of the latch arm 16 may also be  
10   deflected downwardly by a force as represented by arrow 44.  
As such, the latch at the front end 16a of the arm may be  
resiliently snapped into a locking position with the latch  
42 of another connector.

15           Having described the preferred embodiment of the  
latching apparatus of the subject invention, the advantages  
thereof should be now appreciated. The subject latching  
apparatus not only provides for ease of either attaching or  
detaching an electrical connector to or from a mateable  
20   component, but also provides a secured locking arrangement  
when the connector is attached to another connector or the  
like. It should be further appreciated that various  
modifications may be made to the subject latching apparatus  
without departing from the contemplated scope of the  
invention. Accordingly, the preferred embodiment described  
25   herein is intended in an illustrative rather than a  
limiting sense. The true scope of the invention is set  
forth in the claims appended hereto.

1307568

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. In an electrical connector of the type having a housing and a plurality of electrical contacts therein, latching apparatus comprising:

an elongate member deflectably supported by a pivot on said housing, said pivot being located generally intermediate said elongate member such that at least one longitudinal end of said member may move generally transversely toward and away from said housing, said one end of said member including a latch for latching to a latch of another mateable connecting device, and

a movable locking bar captively supported on said housing for slidable movement thereon between a first position and a second position, said locking bar and said member including cooperative locking means disposed on both sides of said pivot operative when said locking bar is in said first position to prevent transverse movement of said one end of said member and non-operative when said locking bar is in said second position, thereby permitting transverse movement of said one end of said member.

2. The invention according to claim 1, wherein said pivot comprises a flexible web.

3. The invention according to claim 1, wherein said locking bar is substantially planar and is slidably captivated between said housing and said member for sliding movement in the longitudinal direction.

4. The invention according to claim 3, wherein said cooperative locking means includes a locking spacer on said member and on said locking bar.

5. The invention according to claim 4, wherein locking spacer

A  
sp:

Claim 5 continued

**1307568**

on said locking bar projects in a direction toward said member and  
away from said housing and the locking spacer on said member projects  
in a direction toward said locking bar and said housing.

A

1 6. The invention according to claim 5, wherein said member  
locking spacer is located adjacent said latch and wherein  
4 said bar locking spacer is located adjacent the opposing  
end of said member.

1 7. The invention according to claim 6, wherein said member  
has at its end opposite said latch a detent recess for  
3 detachable engagement with said bar locking spacer.

1 8. In an electrical connector of the type having a housing  
including a plurality of electrical contacts, said housing  
having a mating end for connection to another electrical  
connector, latching apparatus comprising:

5 an arm pivotally supported on said housing, said  
arm having two opposed ends, one end of which includes a  
latch adjacent the mating end of said connector, a pivot  
being disposed between said two ends of said arm to thereby  
10 permit movement of both of said ends toward and away from  
said housing; and

a slidable locking bar, captively supported on  
said housing for movement between a first position and a  
second position, said bar including a locking spacer  
disposed adjacent one end of said arm and said arm  
15 including a locking spacer disposed adjacent the opposite  
end of said arm, said bar locking spacer being engageable  
with said arm and said arm locking spacer being engageable  
with said bar when said bar is in said first position to  
thereby prevent movement of both of said arm ends relative  
20 to said housing, said bar locking spacer being in  
non-engaged relation with said arm and said arm locking  
spacer being in non-engaged relation with said bar when  
said bar is in said second position to thereby permit  
movement of both ends of said arm relative to said  
25 housing.

1 9. The invention according to claim 8, wherein said arm is  
pivotally supported on said housing by a flexible web  
3 providing a space between said arm and said housing.

- 1 10. The invention according to claim 9, wherein said bar  
2 is slidably captivated in said space.
- 1 11. The invention according to claim 9, wherein said arm  
locking spacer is located adjacent said latch and said bar  
locking spacer is located adjacent the opposite end of said  
4 arm.
- 1 12. The invention according to claim 11, wherein said arm  
locking spacer projects outwardly from said arm toward said  
locking bar and wherein said bar locking spacer projects  
4 outwardly from said bar toward said arm.
- 1 13. The invention according to claim 12, further  
comprising detent means on said arm and locking bar for  
releasably holding said locking bar in said first  
4 position.
- 1 14. The invention according to claim 13, wherein said  
detent means comprises said bar locking spacer and a recess  
formed in said arm at the end opposite said latch for  
resilient receipt therein of a portion of said bar locking  
5 spacer.
- 1 15. The invention according to claim 8, wherein said  
locking bar further includes thereon an upwardly projecting  
protrusion disposed on said bar to coincide with the  
location of said pivot when said locking bar is in said  
5 second position, said protrusion being adapted to contact  
said arm thereat in a manner to minimize loose movement of  
7 said locking bar.



FIG. 1

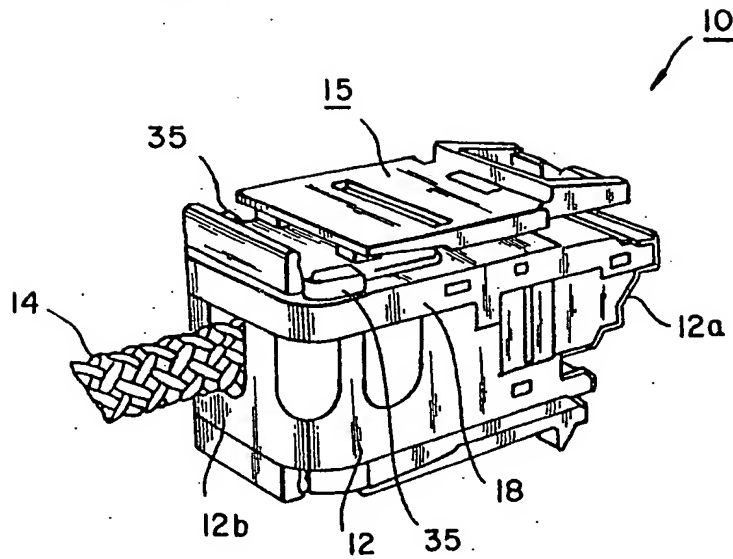


FIG. 2

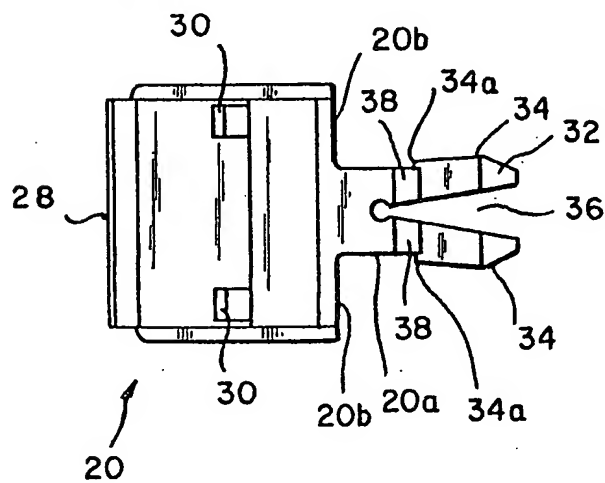


FIG. 3

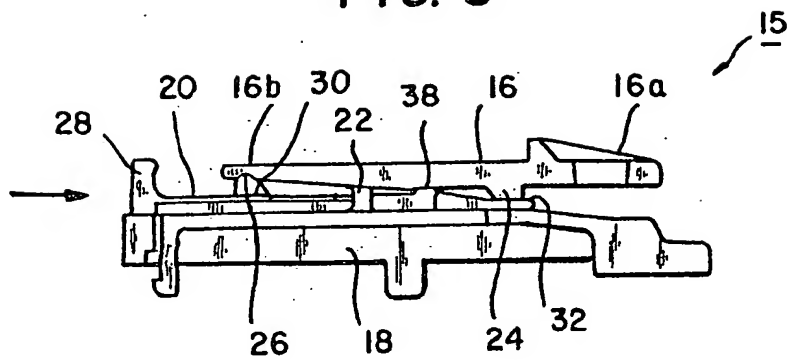


FIG. 4(a)

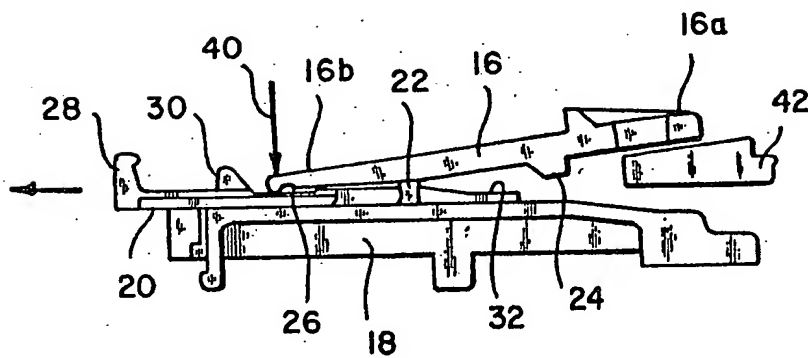


FIG. 4(b)

